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THE CONSTRUCTION AND EVALUATION OF A TEST
ON GEOGRAPHY TERMS

THESIS

Submitted by
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(B.E., Clark University, 1932)

In partial fulfillment of requirements for the
degree of Master of Education

1948

First Reader: W. Linwood Chase, Professor of Education

Second Reader: William H. Cartwright, Assistant Professor of
Education

Third Reader: Franklin C. Roberts, Professor of Education

✓

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School of Education
June 25, 1948
29567

ACKNOWLEDGEMENTS

The writer wishes to express appreciation to Dr. W. Linwood Chase, Professor of Education at Boston University, for his guidance in the planning and conducting of this study. Gratitude is also due to those who made it possible to have the test administered and to the teachers who gave the test.



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TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION AND STATEMENT OF THE PROBLEM. . .	1
II. REVIEW OF RESEARCH	4
III. THE CONSTRUCTION OF THE TEST	11
IV. ANALYSIS OF THE TEST DATA	42
V. SUMMARY	56
BIBLIOGRAPHY	59
APPENDIX	63

LIST OF TABLES

TABLE	PAGE
I. Items Arranged in Descending Order of Misconceptions Held by Pilot Group	16
II. Distribution of Wrong Answers in Items in Tests Given to Pilot Group	22
III. Range of Total Scores of Pupils in Relation to Possible Scores	43
IV. Critical Ratio for Grades Four and Five	46
V. Critical Ratio for Grades Five and Six	46
VI. Individual Item Analysis of Test Scores of Grade Six	49

CHAPTER I

INTRODUCTION AND THE STATEMENT OF THE PROBLEM

CHAPTER I

INTRODUCTION AND THE STATEMENT OF THE PROBLEM

It is almost as absurd to study words one day out of every week as it is to eat one's week supply of salt every Wednesday at twelve. For both word study and salt must be scattered lightly over much of our food for brain or body. ^{1/}

In the study of geography, consideration of the technical terms is one of the first considerations of the teacher. When the child not only knows the meaning of the terms but is able to use them in speaking and writing with ease, they are part of his vocabulary. "The ability to read" does not carry over from one content subject to another. Specific training in the comprehension of special meanings will result in increased attainment in that subject as well as an increased liking for the same. The teacher of each subject is a teacher of reading.

The informal measuring of vocabulary should be a regular practice in a school, not only to learn how many pupils have correct concepts, but to diagnose and aid in planning remedial work.

^{1/} Lucia B. Mirrilees, Teaching Composition and Literature in Junior and Senior High School. New York: Harcourt, Brace and Company, 1943. p. 151

Luella Cole^{2/} in discussing the teaching of technical vocabulary states:

For adequate individual study technical vocabulary the teacher needs the following equipment: (1) for her own use a list of the essential words in the subject being taught; (3) an objective test that is "keyed" to the list; and (4) a home-made dictionary. The procedure in using the equipment is straightforward and simple.

That the writer has felt the need for a list of essential geography terms and an objective test for measuring them was the reason for the selection of the present problem.

Statement of the Problem.

The problem is to construct an objective test of essential geography terms which can be given to Grades IV, V and VI. The evaluating of the test by item analysis to show whether the test is usable will be the main part of the problem.

The purpose of the test will be to make an inventory of terms known by the children and to diagnose for further teaching.

^{2/} Luella Cole, The Elementary School Subjects, New York: Rinehart and Company, Inc., 1946. p 84

CHAPTER II

SUMMARY OF RESEARCH

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SUMMARY OF RESEARCH

In 1944 Mary Willcockson^{1/} did a study on "Some Misconceptions of Fifth Grade Children in Geography." She found that there were twenty-two misconceptions on one page of text read by the children. She discovered that

many misconceptions in geography arise in the intermediate grades because the texts are not supplemented with reference books and visual aids. The only alternative is for textbook writers to make their books much more detailed in content, including an increased number of visual aids. ^{2/}

Joy M. Lacey^{3/} tested the understanding of 125 general concepts by means of pictures. One of the purposes of the study was:

to study the particular meanings which make up the general concepts for the purpose of understanding a little better the trend of children's minds as concepts are developed.

She feels her study should serve as an index to children's interests and the trends of their minds in building concepts.

^{1/}Mary Willcockson, "Some Misconceptions of Fifth Grade Children in Geography," Journal of Geography, XLIII, 6: 229-35, September 1944.

^{2/}loc. cit.

^{3/}Joy M. Lacey., "Social Studies Concepts of Children in the First Three Grades," Contributions to Education, No. 548, Teachers College, Columbia University, 1932. pp. 45-72.

There are two studies that pertain primarily to the vocabulary of geography in the field of map terms. They are those done by Aitchison^{4/} and Hart.^{5/}

A study of the misconceptions which 1,100 pupils, mainly in the sixth, seventh and eighth grades, had of the frigid, temperate and torrid zones, was made by Aitchison. A multiple-choice test consisting of five statements concerning each of the three zones was used to obtain reaction from the subjects. She found that:

certain terms introduced in the elementary grades never created in the minds of the pupils the concepts intended. In some cases this was undoubtedly due to the fact that the terms were not well presented by the teacher because of lack of clearness in her own mind or because of lack of time. On the other hand, in some particular lines the misconceptions are so uniform and so widespread as to make it appear that the terms themselves must have something to do with the erroneous ideas that arise and are perpetuated.^{6/}

^{4/}Allison E. Aitchison, "Torrid, Temperate and Frigid Zones - Sources of Error in Children's Thinking," Investigations in Geography, pp. 483-85. Thirty-Second Yearbook of the National Society for the Study of Education. Bloomington, Illinois: Public School Publishing Company, 1933.

^{5/}Isabell K. Hart, "A Classification of Common Errors in Geography Made by Teachers and Pupils," Investigations in Geography, pp. 479-82. Thirty-Second Yearbook of the National Society for the Study of Education. Bloomington, Illinois: Public School Publishing Company, 1933.

^{6/}Aitchison, op. cit., p. 483

The following deductions were made by Hart,^{7/} as a result of the study:

- (1) Errors traceable to vocabulary difficulties were due to lack of association of words with correct mental concepts.
- (2) Errors were due to lack of association of symbol with mental concept.
- (3) Errors were based on lack of skills and abilities.
- (4) Errors were based on 'half truths' and misconceptions gathered from unconsidered remarks of the teacher and others.
- (5) Errors were based on wrong ideas of cause and effect. ^{8/}

^{9/}Howe gave a test in Grades IV, V and VI. Its purpose was to find if elementary school children are developing the necessary skills for the understanding of maps. In summing up the possibilities tending toward better teaching and learning techniques in the ability to read maps, Mr. Howe recommends in part:

A more careful development of map skills is needed in textbooks. The mere insertion of maps and their correlation with the text is not enough. A definite map vocabulary should accompany the text to assist both teacher and pupil in developing ability to use maps from the simple to the complex. ^{10/}

^{7/}Hart, Loc. cit.

^{8/}Loc. cit.

^{9/}George F. Howe, "A Study of the Ability of Elementary School Pupils to Read Maps," Investigations in Geography, pp. 491-492. Thirty-Second Yearbook of the National Society for the Study of Education. Bloomington, Illinois: Public School Publishing Company, 1933.

^{10/}Loc. cit.

The Bureau of Research in New York City^{11/} conducted a test on map reading ability in 1931. The test was given to one section of the eighth grade. The test consisted of fifty-two questions: thirteen on latitude and longitude, five on direction, sixteen on the use of the legend or key, six on interpretation of special maps showing rainfall, twelve on reasoning out probable effects from causes revealed by a map. The test questions were all of the multiple choice type, the pupils working on maps provided for them. There were a total of 35,452 answers and 64.4 per cent were correct.

The questions were made to apply to the maps in the elementary texts in use by the children. It is obvious that such a test can be made by any teacher in any school system, and should be of distinct value as a teaching aid. The defects revealed in the New York City test are probably indicative of a general situation thruout the country. For this reason these results should be of interest to geography teachers everywhere. ^{12/}

^{11/}The Bureau of Research, New York City, "Testing Map Reading Ability," Journal of Geography, Volume 30:38-42, January, 1931.

^{12/}Loc. cit.

In 1944 Hutter^{13/} of the State Teachers College, Moorhead, Minnesota, gave a geography test to 500 Air Corps cadets to determine their map skills. He used a diagnostic test. Two sheets were given to each cadet. One contained seven questions and the other was a Mercator Map.

"The following is a list of the questions:

1. Place the directions North, -South, -East, -West in proper positions on the margin of this map.
2. a. Write the terms Equator, Cancer, Capricorn, Arctic Circle, and Antarctic Circle along the proper lines.
b. Write in the Prime Meridian and International Date Line along these lines.
3. Indicate which of the cross lines ~~are~~ parallels and which are meridians by writing these terms once along the correct line at some place near the bottom of the map.
4. The parallels and meridians are arranged at 15° intervals. Along the right and bottom of the map label each line correctly for longitude and latitude. Indicate latitude only to the 60th degree but longitude completely.
Along with the degree of longitude and latitude you have placed on the map, indicate the proper hemisphere by using N for Northern; S for Southern; E for Eastern; and W for Western.
5. Place these names as nearly as possible on the land masses they represent: North America, South America, Africa, Asia, Australia, Europe, East Indies, West Indies, Madagascar, Greenland, and the Aleutian Islands.
6. Write in these three ocean basins: Atlantic, Pacific and Indian.

^{13/}Harry K. Hutter, "Mistakes Made in Geography by Beginning Air Corps Cadets, "Journal of Geography, XLIII, 4:233-35

7. Locate as nearly as possible and write on the map:
Tokyo, Rome, Berlin, London and Washington, D.C.

The following percentages of correct answers were obtained:

Question 1.	95.63
2.a	44.26
b	53.71
3.	46.39
4.	19.25
5.	76.61
6.	84.40
7.	72.77

The above summary clearly indicates that there are many incorrect impressions in the use of symbols and their application. It is necessary to go back into the schools of our land beginning in the grades and to demand a sound program of geographic principles, facts and terms based upon good teaching." 14/

McDavitt in a more recent article, concludes that:

The ability to read intelligently and interpret map terms is one of the prime essentials of successful geography study and enjoyment. Many of us, as teachers, fail to stress map reading and terms and to realize that pupils are not able to interpret successfully a map unless they are taught to do it. Furthermore, after the initial teaching, we must constantly use maps to help interpret the geography lessons. We must test their abilities, reteach and test again if we would be successful in helping our pupils master this essential geography tool. 14/

In constructing a test on geography terms, the list of words to be used is the first consideration. Pressey^{15/} has isolated 228 words which she found to be essential.

^{14/}Harry K. Hutter, "Mistakes Made in Geography by Beginning Air Corps Cadets," Journal of Geography, XLIII, 4:233-35.

^{15/}Luella Cole Pressey, "Fundamental Vocabulary in Elementary School Geography," Journal of Geography, XXXII, 2:78-81.

In summarizing she states:

It is hoped that the work done in isolating the essential terms and in making easy the measurement of their mastery by pupils will result in a greater attention being paid to vocabulary. No one can think without meanings; and meanings are symbolized by words. Knowledge of these fundamental meanings is then essential for any real thinking in geography. ^{16/}

^{17/} Stapleton has compiled a list of 502 terms after combining the texts of eight fifth grade geographies. Of this number, 132 or 25 per cent were used in all texts. Stapleton estimated that a total of 400 terms needed to be mastered by elementary pupils before maps could be correctly interpreted.

The Wiedefeld-Walther Geography Test ^{18/} is designed to provide an inventory of pupils' achievements in the several phases of geography as usually taught in Grades four to eight. The test is composed of two parts:

Part 1 tests the abilities and skills needed in the study of geography.

Part 2 tests the control of geographical information or knowledge of geographical facts.

^{16/}Pressey, Loc. cit.

^{17/}Mary Ellen Stapleton, "Map Terms Used in Eight Fifth Grade Geography Texts," unpublished Master's thesis, Boston University, School of Education, 1946.

^{18/}M. Theresa Wiedefeld and E. Curt Walther, Wiedefeld-Walther Geography Test, Manual of Directions (revised), Yonkers-on-Hudson, New York: World Book Company, 1931.

In the Manual for this test Vocabulary is discussed in relation to geography. It states:

Ability to read, to think about, and to discuss geographical matter is dependent largely upon ability to use geographical experience understandingly. Insistence that pupils use geographical terms met by them in readings and discussions leads to clear and concise thinking; neglect of this practice leads to slovenly thinking and inaccurate expression. 19/

19/Ibid. p. 2

CHAPTER III

CONSTRUCTION OF THE TEST

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CONSTRUCTION OF THE TEST

Before constructing the test the first important task was to determine the list of essential geography terms suitable for a test to be used in the intermediate grades. The texts analyzed by Stapleton^{1/} were eight Fifth Grade Geographies. She found that 132 terms were used in all of the eight texts. The writer combed the tables of this study for the 132 terms.

The test was to be objective. The next step was to determine the type of objective test to be used. Greene, Jorgensen and Gerberich^{2/} in their chapter on the "Construction and Use of Informal Tests" state:

The multiple-choice and its numerous variants perhaps represent the most valuable and at the same time the most widely applicable type of objective test item. It is highly objective in scoring. It is readily, although not necessarily easily, adaptable to the measurement of discriminative power, inferential reasoning, interpretative ability, reasoned understanding, generalizing ability, and other types of outcomes deriving from the pupil's ability to apply and use facts.

^{1/}Mary Ellen Stapleton, "Map Terms Used in Eight Fifth Grade Geography Texts," Unpublished Master's Thesis, Boston University, School of Education, 1946

^{2/}Harry A. Greene, Albert N. Jorgensen, and J. Raymond Gerberich, Measurement and Evaluation in the Elementary School, New York: Longmans, Green and Co., Inc., 1942, pp. 177-178.

It is not difficult for pupils to understand and use. It is highly objective, and can be readily scored either by hand or by machine. Item-count procedures based on the results for an individual pupil or class have considerable diagnostic and analytic significance.

... Multiple-choice items are not easily constructed as are some other objective test forms, for there are various technical problems which require great care in the drafting of items. The incorrect answers pupils give to simple recall items often serve as excellent incorrect alternatives if the item is converted to multiple-choice form.^{3/}

The terms (ten a day) were given to the writer's Sixth Grade pupils for the purpose of writing definitions. The incorrect definitions given by some pupils were used as the incorrect alternatives in the multiple-choice test. The incorrect concepts held by one or more children in the class may be the same held by other children in other groups.

The concepts for words like city, railroad, road, street, parks, sheep, forests, pasture, temperature, island, weather, summer, winter, low, many, etc. were good. There were fifty-one words like this eliminated from the 132 terms. The final list was reduced to eighty-one terms.

The correct definitions for the test were taken from two of the eight Fifth Grade Geographies, one by Atwood and Thomas^{4/},

^{3/}Loc. cit.

^{4/}Wallace W. Atwood and Helen Goss Thomas, The American Nations. New York: Ginn and Company, 1943.

the other by McConnell^{5/}. In addition, Atwood's Visits in
Other Lands^{6/} and Thorndike's^{7/} Dictionary were used. A few
were the writer's own.

The final decision was to have a test consisting of
three incorrect answers and one correct answer, four alter-
nate answers in all.

The suggestions for constructing the Multiple-Choice
test given by Greene, Jorgensen and Gerberich^{8/} were followed,
some of which are:

- (1) As much of the statement as possible should occur
in the introductory portion.
- (2) Alternative answers should be stated in correct
grammatical style.
- (3) Incorrect alternatives, or confusions, should be
plausible.
- (4) "A" or "an" should not ordinarily be used to intro-
duce the alternative answers.
- (5) Items should ordinarily have four or five alterna-
tive answers.

^{5/}W. R. McConnell, Geography of the Americas, New York:
Rand McNally & Company, 1945.

^{6/}Wallace W. Atwood and Helen Goss Thomas, Visits in
Other Lands. Boston: Ginn and Company, 1947.

^{7/}E. L. Thorndike, Thorndike Century Junior Dictionary,
Revised Edition. New York: Scott, Foresman and Company,
1942.

^{8/}Harry A. Greene, Albert N. Jorgensen, and J. Raymond
Gerberich, Measurement and Evaluation in the Elementary
School. New York: Longmans, Green and Co., Inc., 1942,
pp. 193-94.

- (6) All items should ordinarily have the same number of alternate answers.
- (7) Alternative answers should ordinarily occur at the end of the statement.
- (8) Answers should be required in a highly objective form.
- (9) Random occurrence of correct responses should be employed. A die may be tossed (disregarding the six) or some other simple chance procedure be used to insure random order in the occurrence of the various correct answer positions.

The plan of the test follows that which Thurstone^{9/} set up for a battery of tests. It was:

- (1) the instructions to the subject with a few examples
- (2) a fore-exercise in which the subject was given an opportunity to try the task under short-time-limit conditions
- (3) the test proper

The distribution of correct answer positions was determined by tossing a die (disregarding the five and six). The result was:

1st position	18
2nd position	19
3rd position	23
4th position	21

The test was criticized by about thirty teachers. A few definitions were revised. Some responses were either

^{9/} L. L. Thurstone, Primary Mental Abilities. Chicago: The University of Chicago Press, 1938. p.11

shortened or lengthened to make a set of four more uniform in length and to prevent the child from choosing the longest one, simply because of length.

ADMINISTERING THE TEST TO A PILOT GROUP

The revised test was given to a Pilot Group of sixty Fifth Grade pupils, twenty-eight boys and thirty-two girls in two different localities of a metropolitan area.

After scoring, the following data was obtained to help determine how usable the test might be:

Number	60
Mean	40.15
S.D.	7.16

It can be seen that the mean was at a mid-point of the possible score. The S. D. indicates that approximately two-thirds of the group of 60 had scores between 33 and 47.

The two following tables were set up to further analyze the data, as to per cents of misconceptions and to the distribution of the wrong answers.

TABLE I

ITEMS ARRANGED IN DESCENDING ORDER OF MISCONCEPTIONS
HELD BY PILOT GROUP

No. of Item ¹	Item	% Wrong
13.	Longitude	93.33
72.	Rainfall less than 10 inches	88.33
68.	Precipitation	86.67
70.	Aridity	85.00
5.	Parallel	85.00
53.	Belt	81.67
11.	Scale of miles	81.67
69.	Rainfall	80.00
2.	Political	80.00
49.	Sound	76.67
46.	Mouth of river	76.67
37.	Delta	76.67
6.	Meridian	76.67
63.	Winter wheat	75.00
73.	Rainfall over 10 inches	73.33

¹/ These numbers indicate the number of the item as it was in the arrangement of the test for the Pilot Group.

TABLE I (continued)

ITEMS ARRANGED IN DESCENDING ORDER OF MISCONCEPTIONS
HELD BY PILOT GROUP

No. of Item	Item	% Wrong
32.	Archipelago	68.33
9.	Tropic of Cancer	68.33
66.	Residence	66.67
25.	Cataract	66.67
81.	Legend	66.67
52.	Zone	65.00
29.	Capital	65.00
23.	Southern limit	65.00
3.	Antarctic	65.00
43.	State	65.00
12.	Latitude	61.67
61.	Barley	60.00
10.	Tropic of Capricorn	60.00
38.	Fiord	58.33
1.	Physical	58.33
45.	Head of navigation	56.67
42.	Piedmont	56.67

TABLE I (continued)

ITEMS ARRANGED IN DESCENDING ORDER OF MISCONCEPTIONS
HELD BY PILOT GROUP

No. of Item	Item	% Wrong
26.	Glacier	56.67
15.	West	56.67
50.	Strait	56.67
79.	Torrid	55.00
77.	Tropical	55.00
60.	Citrus fruits	55.00
59.	Swamps	55.00
28.	River	55.00
76.	Irrigated	53.33
14.	East	53.33
8.	South Pole	53.33
7.	North Pole	53.33
35.	Channel	51.67
4.	Arctic	51.67
75.	Acre	50.00
36.	Continent	48.33

STATE OF NEW YORK IN SENATE January 1, 1901.

REPORT OF THE	COMMISSIONERS OF THE LAND OFFICE	FOR THE YEAR 1900.
ALBANY:	W. H. BROWN, PRINTER.	1901.
1. The State of New York, in the year 1900, had a population of 4,715,900.		
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18. The State of New York, in the year 1900, had a population of 4,715,900.		
19. The State of New York, in the year 1900, had a population of 4,715,900.		
20. The State of New York, in the year 1900, had a population of 4,715,900.		

TABLE I (continued)

ITEMS ARRANGED IN DESCENDING ORDER OF MISCONCEPTIONS
HELD BY PILOT GROUP

No. of Item	Item	% Wrong
67.	Altitude	48.33
48.	Plateau	46.67
44.	Mountain range	46.67
58.	Prairie	45.00
74.	Population per square mile	43.33
33.	Cape	41.67
71.	1 dot equals 100 people	40.00
56.	Woodland	40.00
27.	Canal	40.00
80.	Growing season	36.67
65.	Lead	33.33
54.	Population	31.67
39.	Gulf	31.67
47.	Plain	31.67
64.	Blast furnaces	30.00
22.	Western	28.33
78.	Temperate	26.67

TABLE I (continued)

ITEMS ARRANGED IN DESCENDING ORDER OF MISCONCEPTIONS
HELD BY PILOT GROUP

No. of Item	Item	% Wrong
62.	Sugar cane	26.67
57.	Farmland	23.33
51.	Valley	23.33
34.	Canyon	23.33
21.	Eastern	23.33
31.	Route	20.00
24.	Coast	20.00
20.	Northern land	18.33
18.	Southwest	18.33
17.	Northeast	16.67
16.	Northwest	15.00
19.	Southeast	13.33
55.	Dairy cows	11.67
41.	Lowland	11.67
30.	Tunnel	8.33
40.	Highland	6.67

(continued) 1954

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BUREAU OF AGRICULTURAL ECONOMICS

Commodity	Quantity	Value
Wheat	1,000,000	1.00
Corn	500,000	.50
Soybeans	200,000	.20
Barley	100,000	.10
Rye	50,000	.05
Oats	300,000	.30
Clover	100,000	.10
Alfalfa	100,000	.10
Timothy	100,000	.10
Hemp	100,000	.10
Flax	100,000	.10
Sorghum	100,000	.10
Millet	100,000	.10
Buckwheat	100,000	.10
Rice	100,000	.10
Cotton	100,000	.10
Tobacco	100,000	.10
Sugarcane	100,000	.10
Apples	100,000	.10
Oranges	100,000	.10
Grapes	100,000	.10
Pears	100,000	.10
Plums	100,000	.10
Cherries	100,000	.10
Peaches	100,000	.10
Nectarines	100,000	.10
Apricots	100,000	.10
Pistachios	100,000	.10
Walnuts	100,000	.10
Almonds	100,000	.10
Cashews	100,000	.10
Peanuts	100,000	.10
Sunflower seeds	100,000	.10
Soybean meal	100,000	.10
Corn meal	100,000	.10
Wheat meal	100,000	.10
Barley meal	100,000	.10
Rye meal	100,000	.10
Oat meal	100,000	.10
Clover hay	100,000	.10
Alfalfa hay	100,000	.10
Timothy hay	100,000	.10
Hemp hay	100,000	.10
Flax hay	100,000	.10

Analyzing Table I, four items with lowest per centages ranged from approximately 7 per cent to 12 per cent. If this per cent in the Pilot Group had misconceptions of these terms, it was possible that there would be others in other groups.

TABLE II

DISTRIBUTION OF WRONG ANSWERS IN ITEMS IN TESTS
GIVEN TO PILOT GROUPS

Item	Choices				Item Omitted
	1	2	3	4	
1. Physical	17	10	8	* ^{1/}	
2. Political	*	3	35	9	1
3. Antarctic	14	17	*	8	
4. Arctic	16	4	11	*	
5. Parallel	11	14	*	25	1
6. Meridian	*	14	19	11	2
7. North Pole	27	3	*	2	
8. South Pole	4	6	22	*	
9. Tropic of Cancer	18	11	*	9	3
10. Tropic of Capricorn	*	9	11	13	3
11. Scale of Miles	40	6	2	*	1
12. Latitude	28	*	3	4	2
13. Longitude	17	4	*	35	
14. East	27	2	*	3	
15. West	29	4	*	1	
16. Northwest	*	4	2	3	

^{1/} Indicates the position of the correct answer.

TABLE II (continued)

DISTRIBUTION OF WRONG ANSWERS IN ITEMS IN TESTS
GIVEN TO PILOT GROUPS

Item	1	Choices		4	Item Omitted
		2	3		
17. Northeast	6	2	*	2	
18. Southwest	3	*	3	4	1
19. Southeast	2	*	3	3	
20. Northland	4	*	1	5	1
21. Eastern	*	6	1	7	
22. Western	*	6	7	4	
23. Southern limit	21	17	0	*	1
24. Coast	5	7	0	*	
25. Cataract	16	*	12	10	2
26. Glacier	8	5	*	30	1
27. Canal	*	3	1	20	
28. River	0	19	*	14	
29. Capital	3	24	*	12	
30. Tunnel	*	2	4	0	
31. Route	*	1	5	6	
32. Archipelago	30	*	3	3	5
33. Cape	1	23	1	*	

TABLE II (continued)

DISTRIBUTION OF WRONG ANSWERS IN ITEMS IN TESTS
GIVEN TO PILOT GROUP

Item	Choices				Item Omitted
	1	2	3	4	
34. Canyon	7	*	5	2	
35. Channel	8	*	16	6	1
36. Continent	6	17	*	6	
37. Delta	*	11	14	18	3
38. Fiord	8	15	*	8	3
39. Gulf	6	3	10	*	
40. Highland	0	2	1	*	1
41. Lowland	0	*	7	0	
42. Piedmont	*	18	12	3	1
43. State	15	1	*	23	
44. Mountain range	18	1	9	*	
45. Head of navigation	*	11	17	2	4
46. Mouth of river	*	38	6	2	
47. Plain	13	4	2	*	
48. Plateau	15	3	*	8	2
49. Sound	13	*	15	15	3
50. Strait	10	5	12	*	7

TABLE II (continued)

DISTRIBUTION OF WRONG ANSWERS IN ITEMS IN TESTS
GIVEN TO PILOT GROUP

Item	Choices				Item Omitted
	1	2	3	4	
51. Valley	*	10	0	4	
52. Zone	5	15	*	19	
53. Belt	13	*	18	18	
54. Population	8	4	6	*	1
55. Dairy Cows	1	*	1	5	
56. Woodland	6	*	5	13	
57. Farmland	4	8	2	*	
58. Prairie	15	6	5	*	1
59. Swamps	26	*	4	3	
60. Citrus fruits	14	*	5	12	2
61. Barley	3	25	8	*	
62. Sugar cane	0	*	0	16	
63. Winter wheat	*	6	15	24	
64. Blast furnaces	*	6	8	2	2
65. Lead	2	10	*	7	
66. Residence	14	6	*	20	
67. Altitude	8	5	12	*	4

TABLE II (continued)

DISTRIBUTION OF WRONG ANSWERS IN ITEMS IN TESTS
GIVEN TO PILOT GROUP

Item	Choices				Item Omitted
	1	2	3	4	
68. Precipitation	9	13	*	22	8
69. Rainfall	4	42	2	*	
70. Aridity	16	*	18	11	6
71. 1 dot equals 100 people means	7	*	8	7	2
72. Rainfall less than 10 inches means	11	19	*	10	4
73. Rainfall over 10 inches means	11	19	10	*	4
74. Population per square mile	4	6	*	14	2
75. Acre	13	2	*	14	1
76. Irrigated	8	*	10	8	6
77. Tropical	*	8	2	21	2
78. Temperate	6	4	5	*	1
79. Torrid	*	8	9	12	4
80. Growing Season	1	17	*	4	
81. Legend	14	10	12	*	4

Table 1

Table 1 shows the results of the analysis of variance for the different factors.

Factor	Level	Mean	SD	df	Sum of Squares	Mean Square	F	Prob > F
Factor 1	1	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	2	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	3	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	4	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	5	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	6	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	7	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	8	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	9	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	10	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	11	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	12	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	13	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	14	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	15	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	16	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	17	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	18	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	19	10.0	2.0	1	10.0	10.0	1.0	.33
Factor 1	20	10.0	2.0	1	10.0	10.0	1.0	.33

In Table II four items (16-17-18-19) had a fairly even distribution of wrong answers which showed a possibility of guessing. The test items were rearranged on two of the pages. Items 14-16-18-19-55-57-61 were those changed, as to the position. The test then had the arrangement of the sample to be found in Chapter IV.

The population used for administering the test consisted of 465 fourth, fifth and sixth grade pupils in a metropolitan area. The groups were chosen from five sections, varying in social and economic status. Two groups lived in crowded sections, many of the children coming from foreign-speaking homes and living under limited economic conditions. The other three were in sections where the social and economic conditions ranged from good to very good. The 465 children were distributed as follows:

	Boys	Girls	Total
Grade VI	74	84	158
Grade V	71	84	155
Grade IV	81	71	152
	<u>226</u>	<u>239</u>	<u>465</u>

The Fifth Grades in the Groups tested were using Atwood-Thomas^{10/} Geography text which was one of the eight Geography texts used in Mary Ellen Stapleton's Study.^{11/}

^{10/}Wallace W. Atwood and Helen Goss Thomas, The American Nations. New York: Ginn and Company, 1943

^{11/}Mary Ellen Stapleton, "Map Terms Used in Eight Fifth Grade Geography Texts," Unpublished Master's Thesis, Boston University, School of Education, 1946.

TEST OF GEOGRAPHY TERMS

Name.....Grade.....

Age Last Birthday.....Birthday.....

City or Town.....School.....

Boy or Girl.....Date.....

Score - Number Right

Int.

Number Wrong

Blank page with faint header

.....

.....

.....

.....

.....

.....

TEST OF GEOGRAPHY TERMS

This is a test on the meaning of some words and phrases used in the study of Geography. There are eighty-one words and phrases in this test. These words and phrases are capitalized, like this: TEXTILES mean..... After each word or phrase there are four answers, one of which is CORRECT. Read each one of these answers. Decide which one of them you think is the CORRECT answer. Put the number of the CORRECT answer in the empty space () you will find on the right.

Here is a sample. Read it carefully. Be sure you understand what you must do.

A. PENINSULA means

1. island
2. needle to cure disease
3. body of water
4. "almost an island" A. (4)

In this sample the capitalized word is PENINSULA. The CORRECT answer is: "almost an island". This answer is No. 4. So No. 4 is put in the space at the right to show what the CORRECT answer is.

Here is another sample:

B. NATURAL RESOURCES mean

1. faraway regions
2. places visited by people
3. our gifts from nature
4. finished products B. ()

What do you think is the CORRECT answer? NATURAL RESOURCES mean our gifts from nature. So, the Correct answer is No. 3. Put No. 3 in the space.

(continued)

..... "The End of the Road"

..... 2340-07 00-00015

Complete the third and last sample in the same way. Here it is:

C. TEXTILES mean

1. machinery
2. cotton and woolen goods
3. raw materials
4. materials grown by nature C. ()

Begin the test when the teacher gives the signal. You will have plenty of time.

THE TEST

1. A PHYSICAL MAP shows
 1. where diseases are
 2. rainfall
 3. map is made correctly
 4. height or altitude 1. ()
2. A POLITICAL MAP shows
 1. divisions made by people
 2. rainfall
 3. laws dividing a country
 4. number of people 2. ()
3. THE ANTARCTIC CIRCLE is a
 1. division at the top of the world
 2. circle around the North Pole
 3. line far to the south of the Equator
 4. place that is hot and cold 3. ()
4. THE ARCTIC CIRCLE is a
 1. land near the South Pole
 2. place that is hot and cold
 3. division at the bottom of the world
 4. line nearer to the North Pole than to the Equator. 4. ()
5. A PARALLEL means a
 1. north-south line on a map
 2. magnetized line
 3. east-west line on globes and maps
 4. country running into another 5. ()

6. A MERIDIAN means a
 1. north-south line on the globe
 2. line in the center of the world
 3. kind of map
 4. east-west line on the globe 6. ()
7. THE NORTH POLE means the
 1. continent at the top of the world
 2. imaginary pole in the Antarctic
 3. point farthest north on the earth
 4. region in the south 7. ()
8. THE SOUTH POLE means the
 1. imaginary pole in the Arctic
 2. warmest part of the South
 3. continent at the bottom of the world
 4. point farthest south on the earth 8. ()
9. THE TROPIC of CANCER means a
 1. region of disease
 2. line separating North and South America
 3. line north of the Equator
 4. line south of the Equator 9. ()
10. THE TROPIC OF CAPRICORN means a
 1. line south of the equator
 2. region of disease
 3. line in the middle of the map
 4. separating line for North and South America 10. ()
11. A SCALE of MILES shows
 1. how far a mile or two is
 2. direction
 3. the kind of map
 4. line to be used just as you use a ruler for measuring 11. ()
12. LATITUDE means
 1. height
 2. distance from the equator
 3. east-west lines across a map
 4. north-south lines across a map 12. ()

1.	1. Introduction	1
2.	2. Objectives of the Study	2
3.	3. Methodology	3
4.	4. Results and Discussion	4
5.	5. Conclusion	5
6.	6. References	6
7.	7. Appendix	7
8.	8. Bibliography	8
9.	9. Glossary	9
10.	10. Index	10
11.	11. Summary	11
12.	12. Acknowledgements	12
13.	13. Declaration	13
14.	14. Certificate	14
15.	15. Cover Page	15
16.	16. Title Page	16
17.	17. Abstract	17
18.	18. Executive Summary	18
19.	19. List of Figures	19
20.	20. List of Tables	20
21.	21. List of Equations	21
22.	22. List of Symbols	22
23.	23. List of Abbreviations	23
24.	24. List of Acronyms	24
25.	25. List of Initials	25
26.	26. List of References	26
27.	27. List of Bibliography	27
28.	28. List of Appendix	28
29.	29. List of Glossary	29
30.	30. List of Index	30
31.	31. List of Summary	31
32.	32. List of Acknowledgements	32
33.	33. List of Declaration	33
34.	34. List of Certificate	34
35.	35. List of Cover Page	35
36.	36. List of Title Page	36
37.	37. List of Abstract	37
38.	38. List of Executive Summary	38
39.	39. List of List of Figures	39
40.	40. List of List of Tables	40
41.	41. List of List of Equations	41
42.	42. List of List of Symbols	42
43.	43. List of List of Abbreviations	43
44.	44. List of List of Acronyms	44
45.	45. List of List of Initials	45
46.	46. List of List of References	46
47.	47. List of List of Bibliography	47
48.	48. List of List of Appendix	48
49.	49. List of List of Glossary	49
50.	50. List of List of Index	50
51.	51. List of List of Summary	51
52.	52. List of List of Acknowledgements	52
53.	53. List of List of Declaration	53
54.	54. List of List of Certificate	54
55.	55. List of List of Cover Page	55
56.	56. List of List of Title Page	56
57.	57. List of List of Abstract	57
58.	58. List of List of Executive Summary	58
59.	59. List of List of List of Figures	59
60.	60. List of List of List of Tables	60
61.	61. List of List of List of Equations	61
62.	62. List of List of List of Symbols	62
63.	63. List of List of List of Abbreviations	63
64.	64. List of List of List of Acronyms	64
65.	65. List of List of List of Initials	65
66.	66. List of List of List of References	66
67.	67. List of List of List of Bibliography	67
68.	68. List of List of List of Appendix	68
69.	69. List of List of List of Glossary	69
70.	70. List of List of List of Index	70
71.	71. List of List of List of Summary	71
72.	72. List of List of List of Acknowledgements	72
73.	73. List of List of List of Declaration	73
74.	74. List of List of List of Certificate	74
75.	75. List of List of List of Cover Page	75
76.	76. List of List of List of Title Page	76
77.	77. List of List of List of Abstract	77
78.	78. List of List of List of Executive Summary	78
79.	79. List of List of List of List of Figures	79
80.	80. List of List of List of List of Tables	80
81.	81. List of List of List of List of Equations	81
82.	82. List of List of List of List of Symbols	82
83.	83. List of List of List of List of Abbreviations	83
84.	84. List of List of List of List of Acronyms	84
85.	85. List of List of List of List of Initials	85
86.	86. List of List of List of List of References	86
87.	87. List of List of List of List of Bibliography	87
88.	88. List of List of List of List of Appendix	88
89.	89. List of List of List of List of Glossary	89
90.	90. List of List of List of List of Index	90
91.	91. List of List of List of List of Summary	91
92.	92. List of List of List of List of Acknowledgements	92
93.	93. List of List of List of List of Declaration	93
94.	94. List of List of List of List of Certificate	94
95.	95. List of List of List of List of Cover Page	95
96.	96. List of List of List of List of Title Page	96
97.	97. List of List of List of List of Abstract	97
98.	98. List of List of List of List of Executive Summary	98
99.	99. List of List of List of List of List of Figures	99
100.	100. List of List of List of List of List of Tables	100

13. LONGITUDE means
1. distance from the equator
 2. the northern part of the world
 3. east-west directions on a globe or map
 4. up and down lines on a map 13. ()
14. DAIRY COWS are
1. any cows
 2. cows raised for their milk
 3. those that work for a factory
 4. ones living in dairies 14. ()
15. WEST is the
1. place of medium climate
 2. left-hand side of the map
 3. direction of the sunset
 4. direction that faces you 15. ()
16. BARLEY is
1. wild vegetable
 2. ground wheat
 3. vegetable like an onion only stronger
 4. grasslike plant or its grain 16. ()
17. NORTHEAST is
1. east of the Equator
 2. $23\frac{1}{2}^{\circ}$ above the Equator
 3. halfway between North and East
 4. partly warm and partly cold 17. ()
18. FARMLAND means
1. large plantation
 2. land belonging to a farmer
 3. grazing land
 4. land good for farming 18. ()
19. SOUTHWEST is
1. between South and East
 2. halfway between South and West
 3. on the right of a map
 4. between the Equator and the South Pole 19. ()

1.	Introduction	1
2.	Methodology	2
3.	Results	3
4.	Discussion	4
5.	Conclusion	5
6.	References	6
7.	Appendix	7
8.	Bibliography	8
9.	Index	9
10.	Summary	10
11.	Notes	11
12.	Footnotes	12
13.	Tables	13
14.	Figures	14
15.	Charts	15
16.	Diagrams	16
17.	Equations	17
18.	Formulas	18
19.	Definitions	19
20.	Glossary	20
21.	Acronyms	21
22.	Abbreviations	22
23.	Units	23
24.	Conversions	24
25.	Statistics	25
26.	Mathematics	26
27.	Science	27
28.	History	28
29.	Geography	29
30.	Politics	30
31.	Economics	31
32.	Social Sciences	32
33.	Humanities	33
34.	Arts	34
35.	Law	35
36.	Medicine	36
37.	Engineering	37
38.	Technology	38
39.	Environment	39
40.	Energy	40
41.	Transportation	41
42.	Communication	42
43.	Information	43
44.	Security	44
45.	Defense	45
46.	International	46
47.	Global	47
48.	World	48
49.	Regional	49
50.	Local	50
51.	Community	51
52.	Organization	52
53.	Institution	53
54.	Agency	54
55.	Department	55
56.	Ministry	56
57.	Committee	57
58.	Board	58
59.	Commission	59
60.	Authority	60
61.	Office	61
62.	Center	62
63.	Institute	63
64.	Foundation	64
65.	Association	65
66.	Union	66
67.	League	67
68.	Confederation	68
69.	Commonwealth	69
70.	Republic	70
71.	Empire	71
72.	Kingdom	72
73.	Principality	73
74.	County	74
75.	Parish	75
76.	Ward	76
77.	Neighborhood	77
78.	District	78
79.	Zone	79
80.	Area	80
81.	Region	81
82.	Province	82
83.	State	83
84.	Territory	84
85.	Dependency	85
86.	Autonomous	86
87.	Self-governing	87
88.	Free	88
89.	Independent	89
90.	Sovereign	90
91.	Monarchy	91
92.	Constitution	92
93.	Law	93
94.	Justice	94
95.	Legal	95
96.	System	96
97.	Order	97
98.	Regime	98
99.	Government	99
100.	Administration	100

20. NORTHERN LAND is
1. left on map
 2. toward the north
 3. at the south Pole
 4. land near the Equator 20. ()
21. EASTERN means
1. toward the east
 2. the left part of the world
 3. opposite the Equator
 4. left of north 21. ()
22. WESTERN means
1. toward the west
 2. opposite the Equator
 3. right of north
 4. the right part of the world 22. ()
23. SOUTHERN LIMIT means the
1. beginning of the South
 2. driving limits in the South
 3. things you do in the South
 4. farthest edge toward the South 23. ()
24. COAST means the
1. shore of a city
 2. border line around a city
 3. edge of the earth
 4. land along the sea 24. ()
25. CATARACT means
1. to pay a bill
 2. a large, steep waterfall
 3. a kind of boat
 4. something on a ship 25. ()
26. GLACIER means a
1. piece of ice on a river
 2. huge block of ice in ocean
 3. river of ice
 4. big cake of snow and ice 26. ()

	1. Introduction	1
	2. Objectives	2
	3. Methodology	3
	4. Results	4
	5. Discussion	5
	6. Conclusion	6
	7. References	7
	8. Appendix	8
	9. Glossary	9
	10. Index	10
	11. Bibliography	11
	12. Acknowledgements	12
	13. Appendix A	13
	14. Appendix B	14
	15. Appendix C	15
	16. Appendix D	16
	17. Appendix E	17
	18. Appendix F	18
	19. Appendix G	19
	20. Appendix H	20
	21. Appendix I	21
	22. Appendix J	22
	23. Appendix K	23
	24. Appendix L	24
	25. Appendix M	25
	26. Appendix N	26
	27. Appendix O	27
	28. Appendix P	28
	29. Appendix Q	29
	30. Appendix R	30
	31. Appendix S	31
	32. Appendix T	32
	33. Appendix U	33
	34. Appendix V	34
	35. Appendix W	35
	36. Appendix X	36
	37. Appendix Y	37
	38. Appendix Z	38
	39. Appendix AA	39
	40. Appendix AB	40
	41. Appendix AC	41
	42. Appendix AD	42
	43. Appendix AE	43
	44. Appendix AF	44
	45. Appendix AG	45
	46. Appendix AH	46
	47. Appendix AI	47
	48. Appendix AJ	48
	49. Appendix AK	49
	50. Appendix AL	50
	51. Appendix AM	51
	52. Appendix AN	52
	53. Appendix AO	53
	54. Appendix AP	54
	55. Appendix AQ	55
	56. Appendix AR	56
	57. Appendix AS	57
	58. Appendix AT	58
	59. Appendix AU	59
	60. Appendix AV	60
	61. Appendix AW	61
	62. Appendix AX	62
	63. Appendix AY	63
	64. Appendix AZ	64
	65. Appendix BA	65
	66. Appendix BB	66
	67. Appendix BC	67
	68. Appendix BD	68
	69. Appendix BE	69
	70. Appendix BF	70
	71. Appendix BG	71
	72. Appendix BH	72
	73. Appendix BI	73
	74. Appendix BJ	74
	75. Appendix BK	75
	76. Appendix BL	76
	77. Appendix BM	77
	78. Appendix BN	78
	79. Appendix BO	79
	80. Appendix BP	80
	81. Appendix BQ	81
	82. Appendix BR	82
	83. Appendix BS	83
	84. Appendix BT	84
	85. Appendix BU	85
	86. Appendix BV	86
	87. Appendix BW	87
	88. Appendix BX	88
	89. Appendix BY	89
	90. Appendix BZ	90
	91. Appendix CA	91
	92. Appendix CB	92
	93. Appendix CC	93
	94. Appendix CD	94
	95. Appendix CE	95
	96. Appendix CF	96
	97. Appendix CG	97
	98. Appendix CH	98
	99. Appendix CI	99
	100. Appendix CJ	100
	101. Appendix CK	101
	102. Appendix CL	102
	103. Appendix CM	103
	104. Appendix CN	104
	105. Appendix CO	105
	106. Appendix CP	106
	107. Appendix CQ	107
	108. Appendix CR	108
	109. Appendix CS	109
	110. Appendix CT	110
	111. Appendix CU	111
	112. Appendix CV	112
	113. Appendix CW	113
	114. Appendix CX	114
	115. Appendix CY	115
	116. Appendix CZ	116
	117. Appendix DA	117
	118. Appendix DB	118
	119. Appendix DC	119
	120. Appendix DD	120
	121. Appendix DE	121
	122. Appendix DF	122
	123. Appendix DG	123
	124. Appendix DH	124
	125. Appendix DI	125
	126. Appendix DJ	126
	127. Appendix DK	127
	128. Appendix DL	128
	129. Appendix DM	129
	130. Appendix DN	130
	131. Appendix DO	131
	132. Appendix DP	132
	133. Appendix DQ	133
	134. Appendix DR	134
	135. Appendix DS	135
	136. Appendix DT	136
	137. Appendix DU	137
	138. Appendix DV	138
	139. Appendix DW	139
	140. Appendix DX	140
	141. Appendix DY	141
	142. Appendix DZ	142
	143. Appendix EA	143
	144. Appendix EB	144
	145. Appendix EC	145
	146. Appendix ED	146
	147. Appendix EE	147
	148. Appendix EF	148
	149. Appendix EG	149
	150. Appendix EH	150
	151. Appendix EI	151
	152. Appendix EJ	152
	153. Appendix EK	153
	154. Appendix EL	154
	155. Appendix EM	155
	156. Appendix EN	156
	157. Appendix EO	157
	158. Appendix EP	158
	159. Appendix EQ	159
	160. Appendix ER	160
	161. Appendix ES	161
	162. Appendix ET	162
	163. Appendix EU	163
	164. Appendix EV	164
	165. Appendix EW	165
	166. Appendix EX	166
	167. Appendix EY	167
	168. Appendix EZ	168
	169. Appendix FA	169
	170. Appendix FB	170
	171. Appendix FC	171
	172. Appendix FD	172
	173. Appendix FE	173
	174. Appendix FF	174
	175. Appendix FG	175
	176. Appendix FH	176
	177. Appendix FI	177
	178. Appendix FJ	178
	179. Appendix FK	179
	180. Appendix FL	180
	181. Appendix FM	181
	182. Appendix FN	182
	183. Appendix FO	183
	184. Appendix FP	184
	185. Appendix FQ	185
	186. Appendix FR	186
	187. Appendix FS	187
	188. Appendix FT	188
	189. Appendix FU	189
	190. Appendix FV	190
	191. Appendix FW	191
	192. Appendix FX	192
	193. Appendix FY	193
	194. Appendix FZ	194
	195. Appendix GA	195
	196. Appendix GB	196
	197. Appendix GC	197
	198. Appendix GD	198
	199. Appendix GE	199
	200. Appendix GF	200
	201. Appendix GG	201
	202. Appendix GH	202
	203. Appendix GI	203
	204. Appendix GJ	204
	205. Appendix GK	205
	206. Appendix GL	206
	207. Appendix GM	207
	208. Appendix GN	208
	209. Appendix GO	209
	210. Appendix GP	210
	211. Appendix GQ	211
	212. Appendix GR	212
	213. Appendix GS	213
	214. Appendix GT	214
	215. Appendix GU	215
	216. Appendix GV	216
	217. Appendix GW	217
	218. Appendix GX	218
	219. Appendix GY	219
	220. Appendix GZ	220
	221. Appendix HA	221
	222. Appendix HB	222
	223. Appendix HC	223
	224. Appendix HD	224
	225. Appendix HE	225
	226. Appendix HF	226
	227. Appendix HG	227
	228. Appendix HH	228
	229. Appendix HI	229
	230. Appendix HJ	230
	231. Appendix HK	231
	232. Appendix HL	232
	233. Appendix HM	233
	234. Appendix HN	234
	235. Appendix HO	235
	236. Appendix HP	236
	237. Appendix HQ	237
	238. Appendix HR	238
	239. Appendix HS	239
	240. Appendix HT	240
	241. Appendix HU	241
	242. Appendix HV	242
	243. Appendix HW	243
	244. Appendix HX	244
	245. Appendix HY	245
	246. Appendix HZ	246
	247. Appendix IA	247
	248. Appendix IB	248
	249. Appendix IC	249
	250. Appendix ID	250
	251. Appendix IE	251
	252. Appendix IF	252
	253. Appendix IG	253
	254. Appendix IH	254
	255. Appendix II	255
	256. Appendix IJ	256
	257. Appendix IK	257
	258. Appendix IL	258
	259. Appendix IM	259
	260. Appendix IN	260
	261. Appendix IO	261
	262. Appendix IP	262
	263. Appendix IQ	263
	264. Appendix IR	264
	265. Appendix IS	265
	266. Appendix IT	266
	267. Appendix IU	267
	268. Appendix IV	268
	269. Appendix IW	269
	270. Appendix IX	270
	271. Appendix IY	271
	272. Appendix IZ	272
	273. Appendix JA	273
	274. Appendix JB	274
	275. Appendix JC	275
	276. Appendix JD	276
	277. Appendix JE	277
	278. Appendix JF	278
	279. Appendix JG	279
	280. Appendix JH	280
	281. Appendix JI	281
	282. Appendix JJ	282
	283. Appendix JK	283
	284. Appendix JL	284
	285. Appendix JM	285
	286. Appendix JN	286
	287. Appendix JO	287
	288. Appendix JP	288
	289. Appendix JQ	289
	290. Appendix JR	290
	291. Appendix JS	291
	292. Appendix JT	292
	293. Appendix JU	293
	294. Appendix JV	294
	295. Appendix JW	295
	296. Appendix JX	296
	297. Appendix JY	297
	298. Appendix JZ	298
	299. Appendix KA	299
	300. Appendix KB	300
	301. Appendix KC	301
	302. Appendix KD	302
	303. Appendix KE	303
	304. Appendix KF	304
	305. Appendix KG	305
	306. Appendix KH	306
	307. Appendix KI	307
	308. Appendix KJ	308
	309. Appendix KK	309
	310. Appendix KL	310
	311. Appendix KM	311
	312. Appendix KN	312
	313. Appendix KO	313
	314. Appendix KP	314
	315. Appendix KQ	315
	316. Appendix KR	316
	317. Appendix KS	317
	318. Appendix KT	318
	319. Appendix KU	319
	320. Appendix KV	320
	321. Appendix KW	321
	322. Appendix KX	322
	323. Appendix KY	323
	324. Appendix KZ	324
	325. Appendix LA	325
	326. Appendix LB	326
	327. Appendix LC	327
	328. Appendix LD	328
	329. Appendix LE	329
	330. Appendix LF	330
	331. Appendix LG	331
	332. Appendix LH	332
	333. Appendix LI	333
	334. Appendix LJ	334
	335. Appendix LK	335
	336. Appendix LL	336
	337. Appendix LM	337
	338. Appendix LN	338
	339. Appendix LO	339
	340. Appendix LP	340
	341. Appendix LQ	341
	342. Appendix LR	342
	343. Appendix LS	343
	344. Appendix LT	344
	345. Appendix LU	345
	346. Appendix LV	346
	347. Appendix LW	347
	348. Appendix LX	348
	349. Appendix LY	349
	350. Appendix LZ	350
	351. Appendix MA	351
	352. Appendix MB	352
	353. Appendix MC	353
	354. Appendix MD	354
	355. Appendix ME	355
	356. Appendix MF	356
	357. Appendix MG	357
	358. Appendix MH	358
	359. Appendix MI	359
	360. Appendix MJ	360
	361. Appendix MK	361
	362. Appendix ML	362
	363. Appendix MM	363
	364. Appendix MN	364
	365. Appendix MO	365
	366. Appendix MP	366
	367. Appendix MQ	367
	368. Appendix MR	368
	369. Appendix MS	369
	370. Appendix MT	370
	371. Appendix MU	371
	372. Appendix MV	372
	373. Appendix MW	373
	374. Appendix MX	374
	375. Appendix MY	375
	376. Appendix MZ	376
	377. Appendix NA	377
	378. Appendix NB	378
	379. Appendix NC	379
	380. Appendix ND	380

27. CANAL is a
1. waterway dug across land
2. large river
3. long stream
4. narrow strip of water 27. ()
28. A RIVER means a
1. large swamp
2. body of water
3. large stream of water
4. narrow strip of water 28. ()
29. CAPITAL is the
1. biggest country in the world
2. leading city in a state
3. city where government is located
4. largest city in a state 29. ()
30. A TUNNEL means a
1. underground passage
2. bridge over a road
3. passage under a bridge
4. wide path or street 30. ()
31. A ROUTE means a
1. way to go
2. land and earth
3. part of a district
4. street sign 31. ()
32. ARCHIPELAGO means a
1. place to play archery
2. group of many islands
3. kind of building
4. new pipeline 32. ()
33. A CAPE is a
1. large plantation
2. long beach
3. green island
4. land extending out into water 33. ()

	1. General Introduction	1
	2. Theoretical Framework	2
	3. Methodology	3
1.1	1.1.1. Research Objectives	4
1.2	1.1.2. Research Questions	5
1.3	1.1.3. Significance of the Study	6
2.1	2.1.1. Conceptual Framework	7
2.2	2.1.2. Theoretical Models	8
2.3	2.1.3. Hypotheses	9
3.1	3.1.1. Research Design	10
3.2	3.1.2. Sampling Method	11
3.3	3.1.3. Data Collection	12
3.4	3.1.4. Data Analysis	13
4.1	4.1.1. Results	14
4.2	4.1.2. Discussion	15
4.3	4.1.3. Conclusion	16
5.1	5.1.1. Summary	17
5.2	5.1.2. Recommendations	18
5.3	5.1.3. Limitations	19
5.4	5.1.4. Future Research	20
6.1	6.1.1. Bibliography	21
6.2	6.1.2. Appendix	22
6.3	6.1.3. Glossary	23
6.4	6.1.4. Index	24

34. A CANYON is a
1. hole in ground like a cave
2. narrow valley with steep sides
3. large hole in mountain
4. body of clear water 34. ()
35. A CHANNEL is a
1. small sea in a country
2. body of water joining two larger bodies
3. long, straight tunnel
4. little running stream 35. ()
36. A CONTINENT is a
1. new world
2. large country
3. large division of land
4. very large state 36. ()
37. A DELTA means the
1. river made land
2. beginning of a river
3. river valley that is long
4. land in the middle of a river 37. ()
38. A FIORD is a
1. thing that makes an auto go
2. place to unload cargoes
3. long arm of sea that winds inland
4. new make of car 38. ()
39. A GULF is a
1. passageway
2. great hole in land
3. borderline
4. large bay 39. ()
40. HIGHLAND means
1. narrow lowland
2. place where machines travel
3. strip of land
4. land high above sea level 40. ()

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41. A LOWLAND is
1. Southern land
2. low, flat land
3. worn-down land
4. high plateau 41. ()
42. THE PIEDMONT means
1. upland region
2. valley
3. plain
4. waterfall 42. ()
43. A STATE is a
1. piece of land in a city
2. new country
3. division of a country
4. sort of union 43. ()
44. A MOUNTAIN RANGE means
1. height of mountains
2. kind of weather
3. range of miles
4. row of mountains 44. ()
45. HEAD OF NAVIGATION means the
1. end of navigation
2. captain of a large ship
3. flying quarters for airmen
4. brains in an outfit 45. ()
46. THE MOUTH of a RIVER means the
1. place where the river ends
2. beginning of a river
3. large body of water
4. middle of a river 46. ()
47. A PLAIN is land that is
1. very dry
2. hot
3. barren
4. level 47. ()

	1. Introduction	1
	2. Literature Review	2
	3. Methodology	3
	4. Results	4
	5. Discussion	5
	6. Conclusion	6
	7. References	7
	8. Appendix	8
	9. Glossary	9
	10. Index	10
	11. Bibliography	11
	12. List of Figures	12
	13. List of Tables	13
	14. Acknowledgements	14
	15. Author's Note	15
	16. Declaration of Interest	16
	17. Funding	17
	18. Data Availability	18
	19. Ethics Approval	19
	20. Conflicts of Interest	20
	21. Author Contributions	21
	22. Correspondence	22
	23. Supplementary Materials	23
	24. References	24
	25. Appendix	25
	26. Glossary	26
	27. Index	27
	28. Bibliography	28
	29. List of Figures	29
	30. List of Tables	30
	31. Acknowledgements	31
	32. Author's Note	32
	33. Declaration of Interest	33
	34. Funding	34
	35. Data Availability	35
	36. Ethics Approval	36
	37. Conflicts of Interest	37
	38. Author Contributions	38
	39. Correspondence	39
	40. Supplementary Materials	40
	41. References	41
	42. Appendix	42
	43. Glossary	43
	44. Index	44
	45. Bibliography	45
	46. List of Figures	46
	47. List of Tables	47
	48. Acknowledgements	48
	49. Author's Note	49
	50. Declaration of Interest	50
	51. Funding	51
	52. Data Availability	52
	53. Ethics Approval	53
	54. Conflicts of Interest	54
	55. Author Contributions	55
	56. Correspondence	56
	57. Supplementary Materials	57
	58. References	58
	59. Appendix	59
	60. Glossary	60
	61. Index	61
	62. Bibliography	62
	63. List of Figures	63
	64. List of Tables	64
	65. Acknowledgements	65
	66. Author's Note	66
	67. Declaration of Interest	67
	68. Funding	68
	69. Data Availability	69
	70. Ethics Approval	70
	71. Conflicts of Interest	71
	72. Author Contributions	72
	73. Correspondence	73
	74. Supplementary Materials	74
	75. References	75
	76. Appendix	76
	77. Glossary	77
	78. Index	78
	79. Bibliography	79
	80. List of Figures	80
	81. List of Tables	81
	82. Acknowledgements	82
	83. Author's Note	83
	84. Declaration of Interest	84
	85. Funding	85
	86. Data Availability	86
	87. Ethics Approval	87
	88. Conflicts of Interest	88
	89. Author Contributions	89
	90. Correspondence	90
	91. Supplementary Materials	91
	92. References	92
	93. Appendix	93
	94. Glossary	94
	95. Index	95
	96. Bibliography	96
	97. List of Figures	97
	98. List of Tables	98
	99. Acknowledgements	99
	100. Author's Note	100

48. A PLATEAU is a
1. lowland that is green
2. sheet of ice on the mountains
3. piece of high, level land
4. hot, dry land 48. ()
49. A SOUND is a
1. strip of land
2. long, narrow strip of water
3. large peninsula
4. joining of rivers, lakes 49. ()
50. A STRAIT is a
1. narrow, winding river that flows into sea
2. inland seathat is salt
3. long, narrow path along coast
4. strip of water connecting two bodies of water..50. ()
51. A VALLEY means a
1. lowland between hills or mountains
2. dugout surrounded by hills
3. winding road atop a mountain
4. small country 51. ()
52. A ZONE means the
1. size of a country
2. number of miles
3. region set off or considered
4. boundary of a country or state 52. ()
53. A BELT (on a map)
1. large crop
2. broad strip or band
3. plantation
4. word for wheat crop 53. ()
54. POPULATION
1. growing crops
2. large numbers
3. how many of anything
4. people living in an area 54. ()

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55. EAST is the
1. left-hand side of the map
 2. place of medium climate
 3. direction of the sunrise
 4. direction that faces you 55. ()
56. WOODLAND means
1. place where wood is kept
 2. land covered with trees
 3. where trees have been cut down
 4. land covered with wood 56. ()
57. SOUTHEAST is
1. between Equator and the South Pole
 2. halfway between South and East
 3. between South and West
 4. a warm climate 57. ()
58. PRAIRIE means
1. desert
 2. large plantation
 3. rocky place with caves
 4. grasslands 58. ()
59. SWAMPS
1. streams of dirty water
 2. wet, soft lands
 3. ponds where you put garbage
 4. lands with ditches 59. ()
60. CITRUS FRUITS are
1. fruits from different countries
 2. oranges, grapefruit, lemons and limes
 3. those that are good for you
 4. a mixture of fruits 60. ()
61. NORTHWEST is
1. halfway between North and West
 2. west of the Equator
 3. partly warm and partly cold
 4. $23\frac{1}{2}^{\circ}$ above the Equator 61. ()

62. SUGAR CANE is a
1. plant used for cattle
2. tall plant, chief source of sugar
3. big green leaf
4. sweet food 62. ()
63. WINTER WHEAT is wheat
1. planted in the fall
2. grown in hot houses
3. stored until winter
4. used in the winter 63. ()
64. BLAST FURNACES are furnaces
1. that smelt ore with aid of blast of air
2. overheated in winter
3. used to heat homes in winter
4. that are a new kind 64. ()
65. LEAD is a
1. costly gem
2. heavy bluish-grey metal
3. heavy kind of stone
4. product of coal 65. ()
66. RESIDENCE means
1. your family
2. a room for over-night
3. house, home, abode
4. section where people live 66. ()
67. ALTITUDE means
1. kind of weather
2. lines across a map
3. range of climate
4. height of land 67. ()
68. PRECIPITATION means
1. ahead of time
2. a forecast
3. rain, dew and snow
4. preparation 68. ()

69. RAINFALL means
1. high waterfall
 2. amount of rain
 3. large hailstones
 4. moisture from rain and melting snow 69. ()
70. ARIDITY means
1. hot air
 2. dryness
 3. moisture in the air
 4. storm clouds 70. ()
71. 1 DOT EQUALS 100 PEOPLE means
1. one mile
 2. 100 people live in an area
 3. one square mile
 4. number of people in a city 71. ()
72. RAINFALL LESS THAN 10 INCHES means
1. little storm
 2. amount of rain in one season
 3. one year's rain on one spot
 4. one month's rainfall 72. ()
73. RAINFALL OVER TEN INCHES means
1. normal amount
 2. season's rainfall
 3. month's rainfall
 4. whole year's rain on one spot 73. ()
74. POPULATION per SQUARE MILE means
1. our city's population
 2. population of our country
 3. number of people living on a square mile
 4. a large population in a city 74. ()
75. AN ACRE means
1. any amount of land
 2. land owned by someone
 3. measure of land, 160 sq. rds.
 4. length and width of land 75. ()

	General Introduction	1
	1. The Problem	1
	2. The Method	2
	3. The Results	3
	4. The Conclusion	4
1. The Problem	1.1 The Problem	1
	1.2 The Method	2
	1.3 The Results	3
	1.4 The Conclusion	4
2. The Method	2.1 The Method	2
	2.2 The Results	3
	2.3 The Conclusion	4
3. The Results	3.1 The Results	3
	3.2 The Conclusion	4
4. The Conclusion	4.1 The Conclusion	4
	4.2 The Results	3
	4.3 The Conclusion	4
5. The Conclusion	5.1 The Conclusion	4
	5.2 The Results	3
	5.3 The Conclusion	4
6. The Conclusion	6.1 The Conclusion	4
	6.2 The Results	3
	6.3 The Conclusion	4
7. The Conclusion	7.1 The Conclusion	4
	7.2 The Results	3
	7.3 The Conclusion	4
8. The Conclusion	8.1 The Conclusion	4
	8.2 The Results	3
	8.3 The Conclusion	4
9. The Conclusion	9.1 The Conclusion	4
	9.2 The Results	3
	9.3 The Conclusion	4
10. The Conclusion	10.1 The Conclusion	4
	10.2 The Results	3
	10.3 The Conclusion	4

76. IRRIGATED land means land
1. that is fertile
2. watered by ditches
3. good for farming
4. dry from heat 76. ()
77. TROPICAL means
1. belonging to the hot climate
2. wild, wet land
3. warm weather crops
4. beyond the equator 77. ()
78. TEMPERATE means
1. cold zone
2. hot zone
3. Southern region
4. not very hot or cold 78. ()
79. TORRID means
1. very hot
2. cold zone
3. imaginary line on map
4. below the equator 79. ()
80. GROWING SEASON means the
1. fall of the year
2. summer time
3. part of year good for crops
4. different seasons of the year 80. ()
81. A LEGEND is
1. preview
2. way of doing things
3. key word
4. guide on a map 81. ()

SCORE.....

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CHAPTER IV

ANALYSIS OF DATA

CHAPTER IV

ANALYSIS OF DATA

The test described in Chapter III was built for the purposes of inventory or diagnosis. An analysis from this point of view will naturally center around the amount of accomplishment of the items tested. However, any test, designed to fit more than one selected population, should be sufficiently difficult to meet the needs of the abler pupils and at the same time be easy enough to prove useful to the slower pupils. All the data is therefore interpreted from both points of view.

It was first considered desirable to get an overall picture of the total scores in relation to the possible scores.

TABLE III
RANGE OF TOTAL SCORES OF PUPILS IN RELATION
TO POSSIBLE SCORES

Test Scores	IV	Grades V	VI	Total
75-77	0	0	1	1
72-74	0	0	0	0
69-71	0	3	3	6
66-68	0	3	4	7
63-65	0	8	10	18
60-62	3	13	13	29
57-59	16	6	20	42
54-56	13	6	21	40
51-53	7	4	10	21
48-50	9	7	19	35
45-47	12	12	14	38
42-44	9	13	8	30
39-41	13	10	9	32
36-38	16	9	3	28
33-35	7	20	9	36
30-32	12	16	5	33
27-29	13	12	5	30
24-26	2	5	3	10
21-23	9	7	1	17

TABLE OF THE SQUARES OF THE NUMBERS 1 TO 100

Number	Square	Number	Square	Number	Square
1	1	21	441	41	1681
2	4	22	484	42	1764
3	9	23	529	43	1849
4	16	24	576	44	1936
5	25	25	625	45	2025
6	36	26	676	46	2116
7	49	27	729	47	2209
8	64	28	784	48	2304
9	81	29	841	49	2401
10	100	30	900	50	2500
11	121	31	961	51	2601
12	144	32	1024	52	2704
13	169	33	1089	53	2809
14	196	34	1156	54	2916
15	225	35	1225	55	3025
16	256	36	1296	56	3136
17	289	37	1369	57	3249
18	324	38	1444	58	3364
19	361	39	1521	59	3481
20	400	40	1600	60	3600
21	441	41	1681	61	3721
22	484	42	1764	62	3844
23	529	43	1849	63	3969
24	576	44	1936	64	4096
25	625	45	2025	65	4225
26	676	46	2116	66	4356
27	729	47	2209	67	4489
28	784	48	2304	68	4624
29	841	49	2401	69	4761
30	900	50	2500	70	4900
31	961	51	2601	71	5041
32	1024	52	2704	72	5184
33	1089	53	2809	73	5329
34	1156	54	2916	74	5476
35	1225	55	3025	75	5625
36	1296	56	3136	76	5776
37	1369	57	3249	77	5929
38	1444	58	3364	78	6084
39	1521	59	3481	79	6241
40	1600	60	3600	80	6400
41	1681	61	3721	81	6561
42	1764	62	3844	82	6724
43	1849	63	3969	83	6889
44	1936	64	4096	84	7056
45	2025	65	4225	85	7225
46	2116	66	4356	86	7396
47	2209	67	4489	87	7569
48	2304	68	4624	88	7744
49	2401	69	4761	89	7921
50	2500	70	4900	90	8100
51	2601	71	5041	91	8281
52	2704	72	5184	92	8464
53	2809	73	5329	93	8649
54	2916	74	5476	94	8836
55	3025	75	5625	95	9025
56	3136	76	5776	96	9216
57	3249	77	5929	97	9409
58	3364	78	6084	98	9604
59	3481	79	6241	99	9801
60	3600	80	6400	100	10000

TABLE III (continued)
 RANGE OF TOTAL SCORES OF PUPILS IN RELATION
 TO POSSIBLE SCORES

Test Scores	IV	Grades V	VI	Total
18-20	4	1	0	5
15-17	1	0	0	1
12-14	3	0	0	3
0-11	3	0	0	3
Mean	39.90	42.55	50.23	44.25
S.D.	12.95	13.09	11.19	13.17

All the means fell at a point approximately half way or above half way of the possible score. The sixth grade had the highest mean of 50.25.

A total of 164 children or 35.26 per cent had scores better than 50. The per cent by grades is as follows:

VI	82 scores	or	51.90%
V	43 scores	or	27.74%
IV	39 scores	or	25.66%
Total	164 scores	or	35.26%

A total of 69 or 14.84% of the entire group had scores below 30. The per cent by grades is as follows:

VI	9 scores	or	5.70%
V	25 scores	or	16.13%
IV	35 scores	or	23.03%
<u>Total</u>	<u>69 scores</u>	<u>or</u>	<u>14.84%</u>

The remaining 232 or 49.89% of the entire group had scores from 30 through 50. The per cent by grades is as follows:

VI	67 scores	or	42.41%
V	87 scores	or	56.13%
IV	78 scores	or	51.32%
<u>Total</u>	<u>232 scores</u>	<u>or</u>	<u>49.89%</u>

No pupil had a perfect score. A sixth grader made a score of 76. The lowest scores 9 through 17 were made by fourth graders. The per cent of scattering of scores around the central tendency of each grade is about the same.

TABLE IV

CRITICAL RATIO FOR GRADES FOUR AND FIVE

Grade	Number	Mean	S.D.	S.E.M.	Diff.	S.D.Diff.	C.R.
IV	152	39.90	12.95	1.05	2.65	1.48	1.79
V	155	42.55	13.09	1.05			

The critical ratio is not statistically significant, although the chances are 92 in 100 that the difference is too great to be the result of sampling fluctuations.

TABLE V

CRITICAL RATIO FOR GRADES FIVE AND SIX

Grade	Number	Mean	S.D.	S.E.M.	Diff.	S.D.Diff.	C.R.
V	155	42.55	13.09	1.05	7.68	1.38	5.56
VI	156	50.23	11.19	0.90			

The critical ratio is statistically significant in favor of the sixth grade.

An item analysis was made of the eighty-one items in the test in order to determine which items could be retained. Results from such an analysis also provide a basis for re-constructing the test arranging items according to difficulty. Tests of the forty highest and forty lowest cases from the sixth grade were analyzed. Responses to items were tabulated as right or wrong and transferred into percentages for each group. The Edgerton^{1/} tables were then used for the purpose of obtaining the Standard Error and the Standard Error squared for each item. The final step comprised the computation of the Critical Ratios for each item.

Mills^{2/} makes the following statement:

If a given difference between hypothetical and observed values would occur as a result of chance only 1 time out of 100, or less frequently, we may say that the difference is significant. This means that the results are not consistent with the hypothesis we have set up. If the discrepancy between theory and observation might occur more frequently than 1 time out of 100 solely because of the play of chance, we may say that the difference is not clearly significant. The results are not inconsistent with the hypothesis. The value of T

^{1/}Harold Edgerton and Donald G. Patterson, "Table of Standard Errors and Probable Errors of Percentages for Varying Numbers of Cases, "Photostat from Journal of Applied Psychology. Volume 10:378-91. September, 1926.

^{2/}Frederick C. Mills, Statistical Methods (revised). New York: Henry Holt and Company, 1938. p 471

(the difference between the hypothetical value and the observed mean, in units of the standard error of the mean), corresponding to a probability of 1/100 is 2.576. One hundredth part of the area under the normal curve lies at a distance from the mean, on the x-axis, of 2.576 standard deviations or more. Accordingly, tests of significance may be applied with direct reference to T, interpreted as a normal deviate. A value of 2.576 or more indicates a significant difference, which a value of less than 2.576 indicates that the results are not inconsistent with the hypothesis in question.^{3/}

Table VI shows the item analysis for the test.

^{3/} Ibid. p. 471.

TABLE VI

INDIVIDUAL ITEM ANALYSIS OF TEST SCORES OF GRADE SIX

Number of Items	Percentage of Correct Responses		Diff. %	S.E. Diff.	C.R.
	High 40 Pupils	Low 40 Pupils			
1.	80	38	42	.099	4.242
2.	83	20	63	.086	7.326
3.	90	28	62	.085	7.294
4.	88	35	53	.091	5.824
5.	45	10	35	.092	3.804
6.	43	13	30	.094	3.191
7.	90	38	52	.090	5.778
8.	90	40	50	.090	5.556
9.	93	43	50	.087	5.747
10.	90	53	37	.092	4.022
11.	70	25	45	.099	4.545
12.	30	40	-10	.105	-0.952
13.	38	18	20	.098	2.041
14.	98	65	33	.078	4.231
15.	73	23	50	.097	5.155
16.	63	28	35	.103	3.398
17.	95	73	22	.078	2.821
18.	95	68	27	.081	3.333

Table of the *Properties of the Elements* (continued)

No.	Symbol	Atomic Weight	Atomic Volume		Density
			cm. ³ /mole	g./cm. ³	
101.1	Hg.	200.6	14.7	13.6	13.6
102.0	Pb.	207.2	18.3	11.3	11.3
103.7	Th.	232.0	14.7	15.7	15.7
104.0	Pa.	231.0	14.7	15.7	15.7
105.0	U.	238.0	19.6	19.1	19.1
106.3	Np.	237.0	19.6	19.1	19.1
107.0	Pl.	244.0	19.6	19.1	19.1
108.0	Am.	243.0	19.6	19.1	19.1
109.0	Cm.	247.0	19.6	19.1	19.1
110.0	Bk.	247.0	19.6	19.1	19.1
111.0	Cf.	251.0	19.6	19.1	19.1
112.0	Es.	252.0	19.6	19.1	19.1
113.0	Fm.	257.0	19.6	19.1	19.1
114.0	Md.	258.0	19.6	19.1	19.1
115.0	Lr.	260.0	19.6	19.1	19.1
116.0	Rf.	261.0	19.6	19.1	19.1
117.0	Db.	262.0	19.6	19.1	19.1
118.0	Sg.	266.0	19.6	19.1	19.1
119.0	Bh.	268.0	19.6	19.1	19.1
120.0	Hs.	277.0	19.6	19.1	19.1
121.0	Me.	288.0	19.6	19.1	19.1
122.0	La.	138.9	15.2	9.0	9.0
123.0	Ce.	140.1	15.2	9.0	9.0
124.0	Pr.	140.9	15.2	9.0	9.0
125.0	Nd.	144.2	15.2	9.0	9.0
126.0	Pm.	144.9	15.2	9.0	9.0
127.0	Sm.	150.4	15.2	9.0	9.0
128.0	Eu.	151.9	15.2	9.0	9.0
129.0	Gd.	157.3	15.2	9.0	9.0
130.0	Tb.	158.9	15.2	9.0	9.0
131.0	Dy.	162.5	15.2	9.0	9.0
132.0	Ho.	164.9	15.2	9.0	9.0
133.0	Er.	167.3	15.2	9.0	9.0
134.0	Tm.	168.9	15.2	9.0	9.0
135.0	Yb.	173.0	15.2	9.0	9.0
136.0	Lu.	175.0	15.2	9.0	9.0
137.0	Hf.	178.5	15.2	9.0	9.0
138.0	Ta.	180.9	15.2	9.0	9.0
139.0	W.	183.8	15.2	9.0	9.0
140.0	Re.	186.2	15.2	9.0	9.0
141.0	Os.	190.2	15.2	9.0	9.0
142.0	Ir.	192.2	15.2	9.0	9.0
143.0	Pt.	195.1	15.2	9.0	9.0
144.0	Au.	197.0	15.2	9.0	9.0
145.0	Hg.	200.6	15.2	9.0	9.0

TABLE VI (continued)

INDIVIDUAL ITEM ANALYSIS OF TEST SCORES OF GRADE SIX

Number of Items	Percentages of Correct Responses		Diff. %	S.E. Diff.	C.R.
	High 40 Pupils	Low 40 Pupils			
19.	78	60	18	.100	1.800
20.	100	75	25	.068	3.676
21.	93	60	33	.087	3.793
22.	93	73	20	.081	2.469
23.	85	43	42	.096	4.375
24.	100	73	27	.070	3.857
25.	90	33	57	.088	6.477
26.	35	15	20	.094	2.128
27.	88	40	48	.092	5.217
28.	70	35	35	.103	3.398
29.	43	33	10	.107	0.935
30.	98	75	23	.071	3.239
31.	98	75	23	.071	3.239
32.	78	45	33	.102	3.235
33.	88	60	28	.092	3.043
34.	90	38	52	.090	5.778
35.	90	50	40	.092	4.348

Table 1. Summary of data for the 1990-1991 season.

The data were collected from the 1990-1991 season, and are presented in the following table.

Year	Month	Day	Temperature (°C)		Humidity (%)
			Max	Min	
1990	Jan	1	15	5	65
1990	Jan	15	18	8	68
1990	Jan	30	20	10	70
1990	Feb	1	22	12	72
1990	Feb	15	25	15	75
1990	Feb	28	28	18	78
1990	Mar	1	30	20	80
1990	Mar	15	32	22	82
1990	Mar	30	35	25	85
1990	Apr	1	38	28	88
1990	Apr	15	40	30	90
1990	Apr	30	42	32	92
1990	May	1	45	35	95
1990	May	15	48	38	98
1990	May	30	50	40	100
1990	Jun	1	52	42	100
1990	Jun	15	55	45	100
1990	Jun	30	58	48	100
1990	Jul	1	60	50	100
1990	Jul	15	62	52	100
1990	Jul	30	65	55	100
1990	Aug	1	68	58	100
1990	Aug	15	70	60	100
1990	Aug	30	72	62	100
1990	Sep	1	75	65	100
1990	Sep	15	78	68	100
1990	Sep	30	80	70	100
1990	Oct	1	82	72	100
1990	Oct	15	85	75	100
1990	Oct	30	88	78	100
1990	Nov	1	90	80	100
1990	Nov	15	92	82	100
1990	Nov	30	95	85	100
1990	Dec	1	98	88	100
1990	Dec	15	100	90	100
1990	Dec	30	100	92	100

TABLE VI (continued)

INDIVIDUAL ITEM ANALYSIS OF TEST SCORES OF GRADE SIX

Number of Items	Percentages of Correct Responses		Diff. %	S.E. Diff.	C.R.
	High 40 Pupils	Low 40 Pupils			
36.	63	30	33	.104	3.173
37.	38	18	20	.098	2.042
38.	100	58	42	.078	5.385
39.	95	70	25	.080	3.125
40.	100	98	2	.002	10.000
41.	100	70	30	.072	4.167
42.	68	40	28	.107	2.617
43.	83	28	55	.092	5.978
44.	100	30	70	.072	9.722
45.	25	33	-8	.100	-0.800
46.	58	23	35	.103	3.398
47.	90	45	45	.092	4.891
48.	93	25	68	.079	8.608
49.	75	23	52	.095	5.474
50.	80	40	40	.099	4.040
51.	93	60	33	.087	3.793
52.	65	18	47	.097	4.845

Table 1

Table 1					
No.	Date	Time	Observations		
			Alt.	Dist.	Remarks
1	1911	10.0	10	10	.01
2	1911	10.1	10	10	.01
3	1911	10.2	10	10	.01
4	1911	10.3	10	10	.01
5	1911	10.4	10	10	.01
6	1911	10.5	10	10	.01
7	1911	10.6	10	10	.01
8	1911	10.7	10	10	.01
9	1911	10.8	10	10	.01
10	1911	10.9	10	10	.01
11	1911	11.0	10	10	.01
12	1911	11.1	10	10	.01
13	1911	11.2	10	10	.01
14	1911	11.3	10	10	.01
15	1911	11.4	10	10	.01
16	1911	11.5	10	10	.01
17	1911	11.6	10	10	.01
18	1911	11.7	10	10	.01
19	1911	11.8	10	10	.01
20	1911	11.9	10	10	.01
21	1911	12.0	10	10	.01
22	1911	12.1	10	10	.01
23	1911	12.2	10	10	.01
24	1911	12.3	10	10	.01
25	1911	12.4	10	10	.01
26	1911	12.5	10	10	.01
27	1911	12.6	10	10	.01
28	1911	12.7	10	10	.01
29	1911	12.8	10	10	.01
30	1911	12.9	10	10	.01

TABLE VI (continued)

INDIVIDUAL ITEM ANALYSIS OF TEST SCORES OF GRADE SIX

Number of Items	Percentage of Correct Responses		Diff. %	S.E. Diff.	C.R.
	High 40 Pupils	Low 40 Pupils			
53.	48	43	5	.111	0.450
54.	90	73	17	.084	2.024
55.	93	40	53	.087	6.092
56.	95	55	40	.086	4.651
57.	88	60	28	.092	3.043
58.	65	35	30	.106	2.830
59.	73	35	38	.102	3.725
60.	73	23	50	.097	5.155
61.	90	50	40	.091	4.396
62.	100	68	32	.074	4.324
63.	75	40	35	.103	3.398
64.	95	48	47	.086	5.465
65.	50	53	-3	.112	-0.268
66.	85	23	62	.087	7.126
67.	75	33	42	.100	4.200
68.	40	23	17	.102	1.667
69.	13	18	-5	.081	-0.617

Table 1.1

Table 1.1: Data for various parameters					
Parameters and their values					
Parameter	Value 1	Value 2	Value 3	Value 4	Value 5
1.1.1	10.5	12.3	15.7	18.9	22.1
1.1.2	20.1	25.4	30.8	35.2	40.6
1.1.3	30.2	35.6	40.9	45.3	50.7
1.1.4	40.3	45.7	51.0	56.4	61.8
1.1.5	50.4	55.8	61.1	66.5	71.9
1.1.6	60.5	65.9	71.2	76.6	82.0
1.1.7	70.6	76.0	81.3	86.7	92.1
1.1.8	80.7	86.1	91.4	96.8	102.2
1.1.9	90.8	96.2	101.5	106.9	112.3
1.1.10	100.9	106.3	111.6	117.0	122.4
1.1.11	111.0	116.4	121.7	127.1	132.5
1.1.12	121.1	126.5	131.8	137.2	142.6
1.1.13	131.2	136.6	141.9	147.3	152.7
1.1.14	141.3	146.7	152.0	157.4	162.8
1.1.15	151.4	156.8	162.1	167.5	172.9
1.1.16	161.5	166.9	172.2	177.6	183.0
1.1.17	171.6	177.0	182.3	187.7	193.1
1.1.18	181.7	187.1	192.4	197.8	203.2
1.1.19	191.8	197.2	202.5	207.9	213.3
1.1.20	201.9	207.3	212.6	218.0	223.4

TABLE VI (continued)

INDIVIDUAL ITEM ANALYSIS OF TEST SCORES OF GRADE SIX

Number of Items	Percentage of Correct Responses		Diff. %	S.E. Diff.	C.R.
	High 40 Pupils	Low 40 Pupils			
70.	53	18	35	.100	3.500
71.	88	35	53	.091	5.824
72.	40	10	30	.090	3.333
73.	48	10	38	.092	4.130
74.	98	68	30	.077	3.896
75.	100	28	72	.071	10.141
76.	93	30	63	.082	7.683
77.	65	53	12	.109	1.101
78.	85	60	25	.095	2.632
79.	88	43	45	.093	4.839
80.	98	48	50	.082	6.098
81.	35	43	-8	.108	-0.741

Study of Table VI reveals that 66 items are statistically significant, in comparison with the desired criterion of 2.576.

Items running lower than 2.576 are 12, 13, 19, 22, 26, 29, 37, 45, 53, 54, 65, 68, 69, 77, 81 (fifteen in all.) These should be discarded from the test, as the Critical Ratios are not statistically significant.

CHAPTER V

SUMMARY

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SUMMARY

The purpose of this study was the construction and evaluation of a test on Geography Terms for the intermediate grades. The test was administered to 465 children in schools of a metropolitan area which may be considered typical of children in the intermediate grades.

The study was limited in that there were no intelligence quotients for the group tested. The data obtained from the administration were analyzed statistically with the following conclusions:

1. The test was within the ability of pupils in Grades IV, V, VI.
2. No score was perfect. There was a ceiling for all groups.
3. The items analyzed revealed 15 items as not statistically significant and discriminating.
4. The C.R. between the fifth and sixth grades was statistically significant, in favor of the sixth grade.
5. The test should be revised.

The suggestions for further research are as follows:

1. A study made to determine the effect of Intelligence Quotient on accomplishment.
2. A comparison of rural and metropolitan districts, after administering the test in the same.

3. It would be of interest to test different groups using some of the different texts mentioned in Mary Ellen Stapleton's study.^{1/}
4. The test may be supplemented by one using a map to check the comprehension of directions and place terms, administering them at one grade level or three.
5. The same list of terms may be used to test concepts by means of slides or pictures.

^{1/}Mary Ellen Stapleton, "Map Terms Used in Eight Fifth Grade Geography Texts," Unpublished Master's thesis, Boston University, School of Education, 1946.

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APPENDIX

A. DIRECTIONS FOR ADMINISTERING THE TEST

Preliminary directions

Make provision for a quiet room, free from interruptions. Take care of the lighting and ventilation.

All desks should be cleared and each child equipped with a sharpened pencil. Have on hand a box of sharpened pencils.

Be sure to have the attention of every child before giving directions.

Time

There is no time limit, but for the information of the teacher, thirty minutes is ample time for an average class.

Filling out the title page

Holding up the test booklet, the examiner points to the blank spaces, saying, "Fill in these blank spaces as quickly as you can. Write plainly. If your pencil breaks raise your hand and I will give you another one."

"Now turn back the title page and listen while I read the first and second paragraphs."

The teacher reads the first sample, calling attention to the position of the answer to be recorded. After reading the second sample, the children write in the correct answer, the teacher showing the place.

After reading the third sample, give the children ample time to write in the answer. Check for accuracy.

"Now begin the test. You will have plenty of time."

B. DIRECTIONS FOR SCORING

For convenience of scoring, paper the test size, may be folded lengthwise into four parts. Answers for four pages may be placed on same, folding back each column as checked. At least three of these sheets will be necessary.

In marking, disregard the three samples.

At the bottom of each page, write the number of incorrect answers. Add and subtract from 81. On title page write the number of correct and incorrect answers.

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